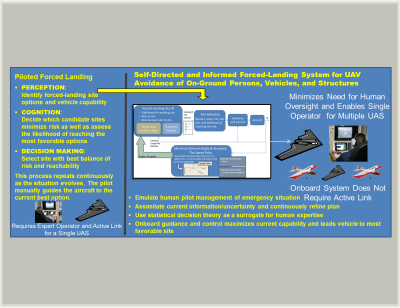
Small Business Innovation Research/Small Business Tech Transfer

Self-Directed and Informed Forced-Landing System for UAV Avoidance of On-Ground Persons, Vehicles, and Structures, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

During a piloted forced landing in which the aircraft can no longer maintain level flight and is therefore forced to make an emergency off-airport landing, the human pilot continuously reassesses and updates the plan to minimize on-ground and onboard injury and damage. In the case of an unmanned air vehicle, this level of intelligent risk minimization is unavailable. Moreover, low-weight and low-cost design objectives for unmanned aircraft have resulted in a lack of propulsion and control redundancy, as well as unreliable communication links and an associated increase in incidents due to engine failure, control failure, and lost link. Safe integration of Unmanned Aircraft System (UAS) into the National Airspace System (NAS) will require an onboard capability for unmanned aircraft to accomplish the complex observation, understanding, and decision making that is required without assistance from a human operator. An advanced system capable of perception, cognition, and decision making is necessary to replace the need for a dedicated expert operator to ensure safety to persons, vehicles, and structures on the ground during UAS forced landings. Deployment of such a system would enable multiple UAS to be supervised by a single operator without compromising safety. The Self-Directed and Informed Forced Landing system emulates the continuous decision making process of a human pilot by assimilating available information and constantly reevaluating the plan. Robust, onboard guidance and control maximize the capability of the impaired aircraft while executing the current plan. The system considers current vehicle capability, wind estimates, landing site and route risk, as well as the uncertainty associated with these factors. Also, system design decisions have been, and will continue to be, weighed against current and near-future verification, validation, and certification requirements.



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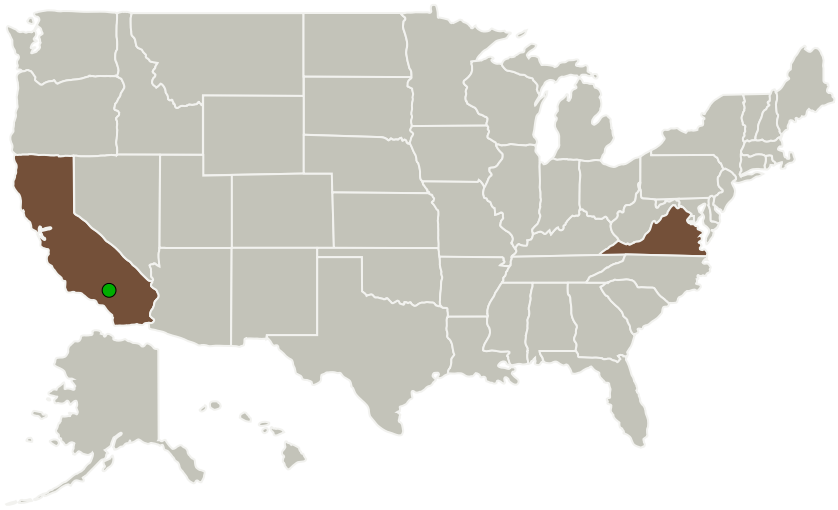
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Barron Associates, Inc.	Lead Organization	Industry	Charlottesville, Virginia
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139892)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Barron Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

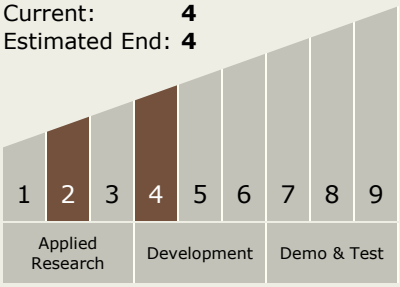
Carlos Torrez

Principal Investigator:

Richard Adams

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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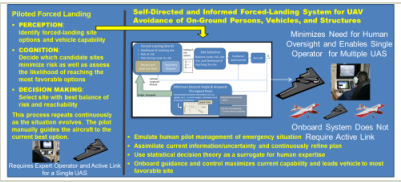
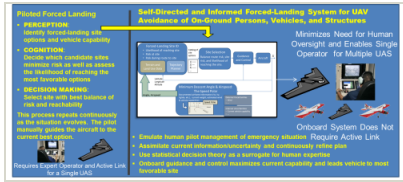
Images



Briefing Chart Image
Self-Directed and Informed Forced-Landing System for UAV Avoidance of On-Ground Persons, Vehicles, and Structures, Phase I *(https://techport.nasa.gov/image/136127)*



Final Summary Chart Image
Self-Directed and Informed Forced-Landing System for UAV Avoidance of On-Ground Persons, Vehicles, and Structures, Phase I Project Image *(https://techport.nasa.gov/image/128673)*

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System